

Date: Monday, 5/7/2007 3:24:20 PM
 User: Kim Johnston

Process Sheet

Customer : CU-DAR001 Dart Helicopters Services Drawing Name : BLADE FITTING
 Job Number : 32233
 Estimate Number : 12300
 P.O. Number :
 This Issue : 5/7/2007 S.O. No. :
 Prsht Rev. : NC
 First Issue : 1/1 Type : MACHINED PARTS
 Previous Run : 30764
 Written By :
 Checked & Approved By : AD1.05.07
 Comment : Est Rev:A New Issue 06-02-28 JLM
 Est Rev:B As per Rev B 06-03-30 JLM

Part Number : D3488042
 Drawing Number : D3488 / DSK101
 Project Number : N/A
 Drawing Revision : B / D
 Material :
 Due Date : 5/30/2007 Qty: 20 Um: Each

Additional Product

Job Number:



Seq. #: Machine Or Operation: Description :

1.0 D6103003 alum billet



Comment: Qty.: 1.0000 Each(s)/Unit Total: 20.0000 Each(s)

Alluminum: Round Billet D6103-003

Batch: B33275

2.0 MORI SEIKI EC MORI SEIKI CNC LATHE LARGE



Comment: MORI SEIKI CNC LATHE LARGE

1-Turn as per Dwg DSK 101 & Folio FA627

2-Deburr

SL / 28 07/07/19

3.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

SL / 28 07/07/20

4.0 HAAS1 HAAS CNC VERTICAL MACHINING #1



Comment: HAAS CNC VERTICAL MACHINING #1

1-Machine as per Folio FA627 & Dwg D3488

2-Deburr

1-J.F. 07/08/03

5.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE




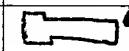
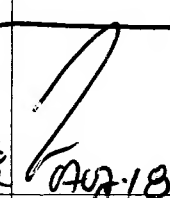

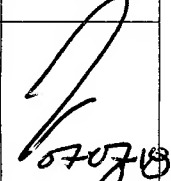
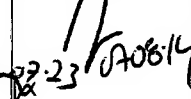
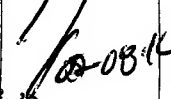
Comment: INSPECT PARTS AS THEY COME OFF MACHINE

1-J.F. 07/08/03

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	

Part No: D3488-042 PAR #: N/A Fault Category: Proc - cnc NCR: Yes No DQA: 14 Date: 07.08.16
 QA: N/C Closed: 18 Date: 07.08.21

NCR: <u>32233</u>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
07.07.18	2.0	1st part is 0.004" under tolerance at the fwd end of the fitting, and is good at the aft end. Part tapered down. R.O.C. taper was caused by the tail stock off center.		 *1 part only. - part is acceptable. - Adjust program to compensate for the taper	PH per Q51042 07.07.18 see attached email J.L. 07/08/14			
07.07.23	2.0	INSIDE BORE HAS CHATTER MARKS. VARIOUS SIZES	PH 07.07.23 per Q51042	RE-MACHINE BORE TO 2.200" MAX SEE ATTACHED ANALYSIS	PH 07.07.23 per Q51042 J.L.		PH per Q51042 07.07.23	

NOTE: Date & initial all entries

Date: Monday, 5/7/2007 3:24:21 PM
User: Kim Johnston

Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 32233

Part Number: D3488042

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

QC8

SECOND CHECK



ml 07-08-07

(31)

Comment: SECOND CHECK

7.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

ml 07 08 09

(31)

8.0

POWDER COATING

POWDER COATING



M105068

(31X)

Comment: POWDER COATING

Powder Coat White Gloss (Ref: 4.3.5.1) as per QSI 005 4.3

ml 07/08/10

9.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



ml 07 08 10

(31)

Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

10.0

ALS71032225

INSERT



*

Comment: Qty.: 4.0000 Each(s)/Unit Total : 80.0000 Each(s)

Pick:

Qty Part Number Description Batch
4 ALS7-1032-225 Insert

M19393

ml

11.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



(31X)

Comment: HAND FINISHING RESOURCE #1

Install Inserts as per Dwg D3488

ml 07/08/11

12.0

QC5

INSPECT WORK TO CURRENT STEP



checked

Comment: INSPECT WORK TO CURRENT STEP

Er 07/08/13

13.0

PACKAGING 1

PACKAGING RESOURCE #1



(31X)

Comment: PACKAGING RESOURCE #1

Identify and Stock

Location:

Finishing

ml 07/08/13

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Date: Monday, 5/7/2007 3:24:21 PM
User: Kim Johnston

Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 32233

Part Number: D3488042

Job Number:



Seq. #:

Machine Or Operation:

Description :

14.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

07.08.13

Job Completion



07/08/13

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	32233
Description: Blade Fitting, RH		Part Number:	D3488-2
Inspection Dwg: D3488 Rev: B		Page 1 of 1	

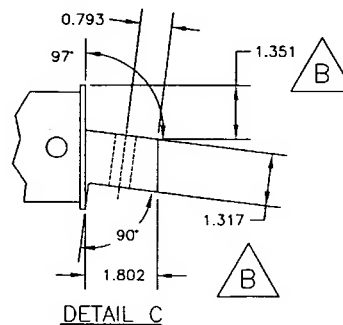
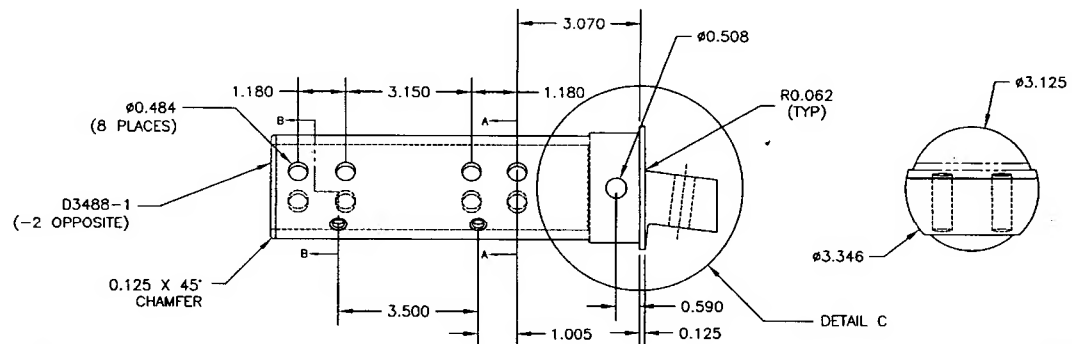
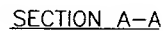
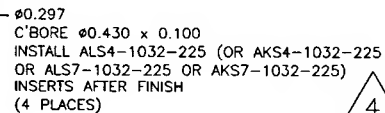
FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
0.125	+/-0.010	0.127"	✓			
2.620	+/-0.010	2.623"	✓			
0.793	+/-0.010	0.793"	✓			
1.351	+/-0.010	1.341"	✓			
1.317	+/-0.010	1.327"	✓			
90°	+/-0.1°	90°	✓			
1.802	+/-0.010	1.803"	✓			
Ø0.508	+0.006/-0.001	Ø0.509"	✓			
R0.062	+/-0.010	R0.062"	✓			
1.500	+/-0.010	1.498"	✓			
X 8.000	+0.030/-0.000	8.006"	✓			
11.18	+/-0.030	11.182"	✓			
Ø0.484	+0.005/-0.001	Ø0.485"	✓			
1.180	+/-0.010	1.180"	✓			
3.150	+/-0.010	3.150"	✓			
3.070	+/-0.010	3.070"	✓			
0.590	+/-0.010	0.590"	✓			
0.125	+/-0.010	0.135"	✓			
1.005	+/-0.010	1.005"	✓			
3.500	+/-0.010	3.502"	✓			
Ø0.297	+0.005/-0.000	Ø0.299"	✓			
Ø0.430	+/-0.010	Ø0.432"	✓			
0.100	+/-0.010	0.105"	✓			

Measured by:	J.F.	Audited by:	SD	Prototype Approval:	N/A
Date:	07/08/02	Date:	07.08.03	Date:	N/A

Rev	Date	Change	Revised by	Approved
A	06.03.31	New Issue	KJ/JLM	AK




QTY -041	QTY -042	PART NUMBER	DESCRIPTION
X		D3488-041	BLADE FITTING ASSEMBLY (LH)
	X	D3488-042	BLADE FITTING ASSEMBLY (RH)
		D3488-1	BLADE FITTING (LH)
	1	D3488-2	BLADE FITTING (RH)
4	4	ALS4-1032-225 or AKS4-1032-225 or ALS7-1032-225 or AKS7-1032-225	INSERT

- 1) MATERIAL: MAKE D3488-1/-2 FROM ALUMINUM 7075-T7351 ROUND BAR
PER QQ-A-225/9
(REF. DART MATERIAL SPEC M7075T73R)
- 2) FINISH: ACID ETCH, ALDOPNE PER DART QSI 005 4.1
POWDER COAT WHITE (REF 4.3.5.1) PER DART QSI 005 4.3
- 3) BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
- 4) INSTALL INSERTS AFTER POWDER COAT
- 5) ALL DIMENSIONS ARE IN INCHES
- 6) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED

D3488-041 SHOWN (D3488-042 OPPOSITE)

RELEASED
04.05.27 PM
PER OS
ECL 4739

B	06.03.15	CHANGE THICKNESS	
A	05.12.20	NEW ISSUE	
DESIGN	<i>PH</i>	DRAWN BY	<i>PH</i>
		 DART AEROSPACE USA, INC. PORTLAND, OREGON, USA	
CHECKED	<i>PH</i>	APPROVED	<i>PH</i>
DATE		DRAWING NO.	REV. B
06.03.15		D3488	SHEET 1 OF 1
		TITLE	SCALE
		BLADE FITTING	1:3

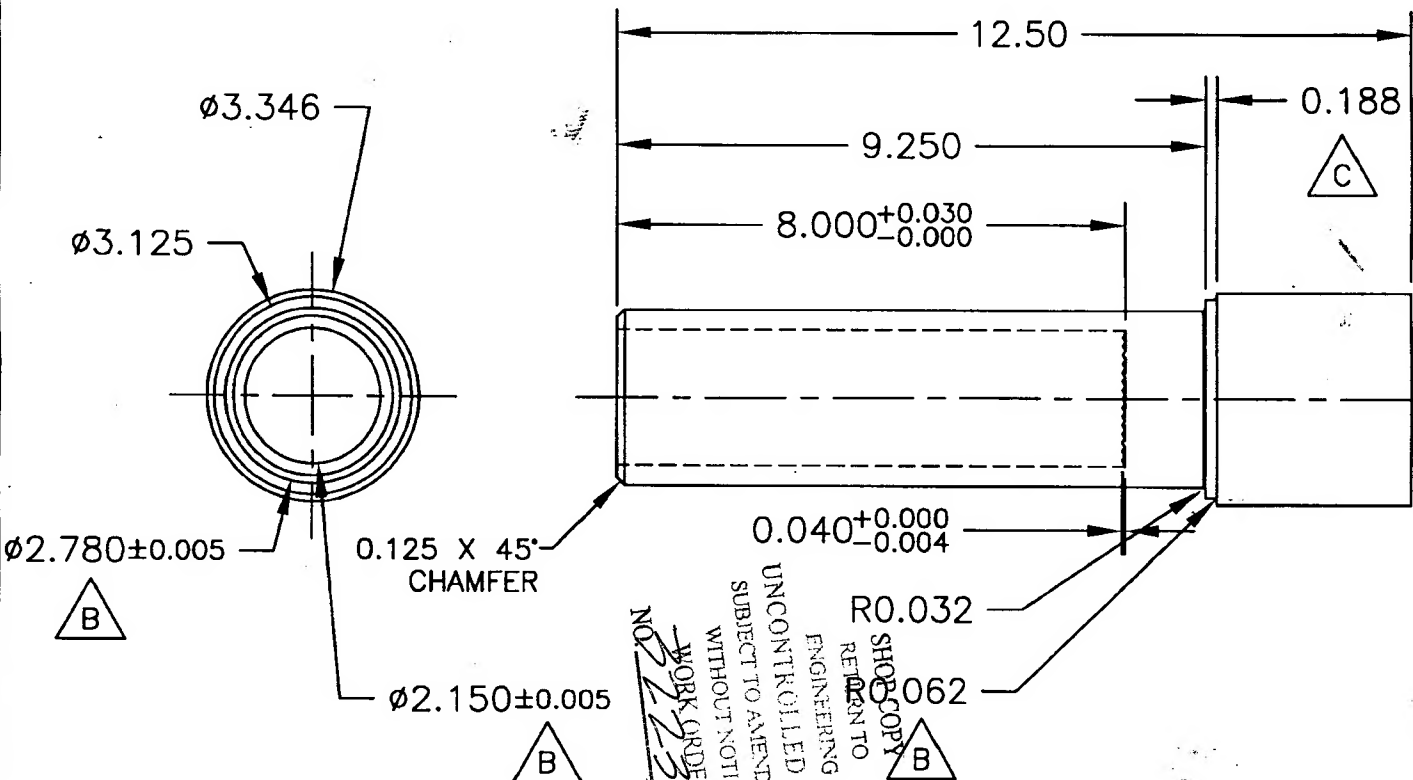
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NO. 2223

DART

DESIGN	014	DRAWN BY	014	DART AEROSPACE USA, INC.	REV. D
CHECKED	<i>[Signature]</i>	APPROVED	<i>[Signature]</i>	PORT HADLOCK, WA	
DATE	06.05.09	TITLE	DSK 101	DRAWING NO.	SHEET 1 OF 1
				D3488-1/-2. TURNING DETAIL	SCALE 1:3
A	05.12.21	NEW ISSUE			
B	06.03.02	ADD TOLERANCES AND RADIUS			
C	06.04.17	0.188 WAS 0.125			
D	06.05.09	REMOVE DIAMETER FOR CHAMFER			

**DSK 101**

- 1) MATERIAL: MAKE FROM ALUMINUM 7075-T7351 ROUND BAR PER QQ-A-225/9 (REF. DART MATERIAL SPEC M7075T73R)
- 2) FINISH: NONE
- 3) BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
- 4) ALL DIMENSIONS ARE IN INCHES
- 5) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED

Peter Hum

From: David Shepherd [dshepherd@dartaero.com]
Sent: July 18, 2007 4:11 PM
To: 'Peter Hum'
Cc: 'L Lacelle'
Subject: RE: D3488 blade fitting turning detail deviation

Peter,

The part you describe below is acceptable.

David

From: Peter Hum [mailto:phum@dartaero.com]
Sent: Wednesday, July 18, 2007 9:45 AM
To: 'David Shepherd'
Subject: D3488 blade fitting turning detail deviation

David,

The turning detail for the D3488 blade fitting has one end turned to 2.771 OD and the other end is at 2.780 OD, there is a taper here. This was caused by machining, this part is the 1st off and the rest will be IAW with the drawing. See the attached photo.

The nominal dimension is 2.780 +/- 0.005.

I know I'm allowed to approve this based on QSI 042 since I have an approved stress report to refer to, see attached. My stress analysis says its okay. I used the smallest dimension 2.771" OD

However, since this tube is tapered from 2.780" to 2.771" over a length of 9.25";

Is this deviation acceptable?

Thanks
Peter

No virus found in this incoming message.
Checked by AVG Free Edition.
Version: 7.5.476 / Virus Database: 269.10.8/906 - Release Date: 7/17/2007 6:30 PM

No virus found in this outgoing message.
Checked by AVG Free Edition.
Version: 7.5.476 / Virus Database: 269.10.8/906 - Release Date: 7/17/2007 6:30 PM

18/07/2007

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MSL 104/104/516 SS SHEET PER AMS 5510 OR AMS 5524
20 GAUGE (0.018 THICK)
(REF PART MATERIAL SPEC 100A+200A)
POWDER COAT GREY SANDER (REF 4.15.6)
INCHES
REF PART 051 005 4 11
051 018 UNLESS OTHERWISE NOTED
2019

WASH STATE

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 08-08-2008 BY 60322
UCBAW

2000

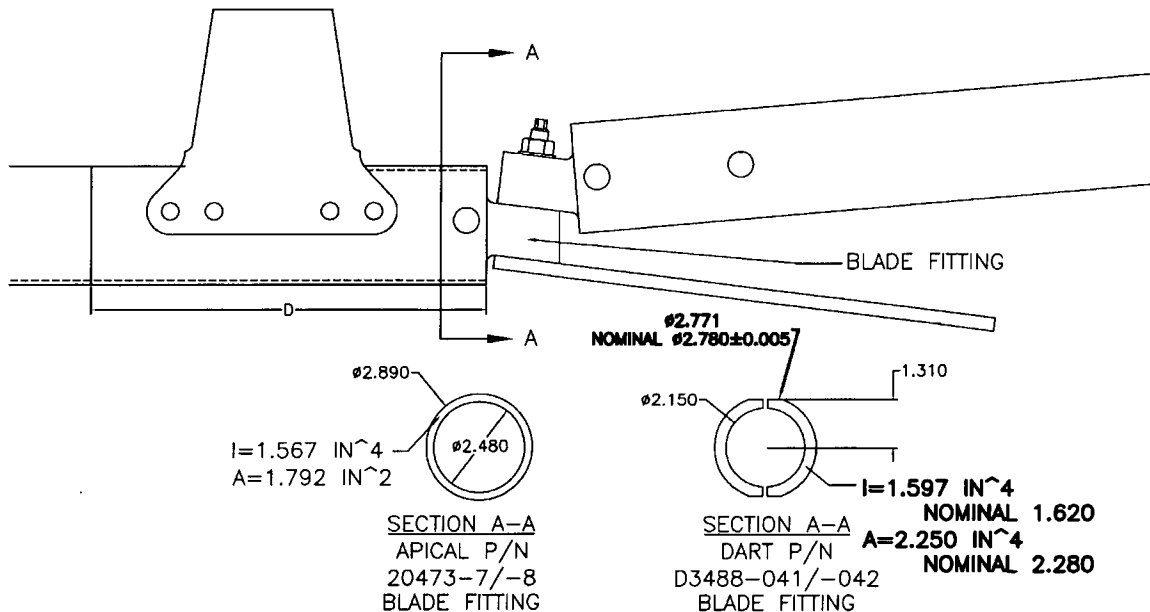
10507 0107
800 1

For installation of the Apical Tri-bag and Apical Cylindrical Float bag systems onto OEM skid tubes; it is required that the OEM P/N 350A41-1077-24/-25 blade fitting be substituted with the Apical P/N 20473-7/-8 blade fitting. In the proposed Dart skid tube configuration, the Dart D3488-041/-042 blade fitting will replace the Apical P/N 20473-7/-8 blade fitting.

In the Dart system, blade fitting D3488-041/-042 will be used to transfer load into the web of the skid tube assembly. On the outside of the skid tube, D3488-041/-042 is dimensionally identical to the Apical P/N 20473-7/-8 blade fitting and is manufactured from the same 7075-T7351 material. Therefore, the Dart blade fitting and the Apical blade fitting have identical structural capability. The longitudinal location of the holes on the D3488-041/-042 blade fitting used to mount the aft crosstube are identical to the Apical P/N 20473-7/-8 blade fitting. On the inside of the skid tube, D3488-041/-042 has been designed to withstand higher bending moments than the Apical fitting.

The following table compares the Dart D3488-041/-042 blade fitting to the Apical 20473-7/-8 blade fitting.

Component	Dart D3488-041/-042	Apical P/N 20473-7/-8
Material	7075-T7351 per QQ-A-225/9	7075-T7351 per QQ-A-225/9
(I) Moment of Inertia of portion inside skid tube	1.597 in ⁴ (from D3488-041/-042 dwg)	1.567 in ⁴ (from D20473-7/-8 dwg)
(C) Distance to outer fibers	1.310 in (from D3488-041/-042 dwg)	1.445 in (from 20473-7/-8 dwg)
(A) Area at section A-A	2.250 in ²	1.792 in ²
Z=I/C at section A-A	1.219 in ³	1.084 in ³
D	10.69 in	10.53 in



DART

RH
07.07.23

Re: 03488-041/-042 blade fitting deviation

Based on approved SR-D350-635-2 Rev. B
the ID of the bore can be opened to $\phi 2.200$ max.
As shown the I/C, A, D are greater for the
Dart blade fitting compared to the typical fitting

- Approval per QSI 042

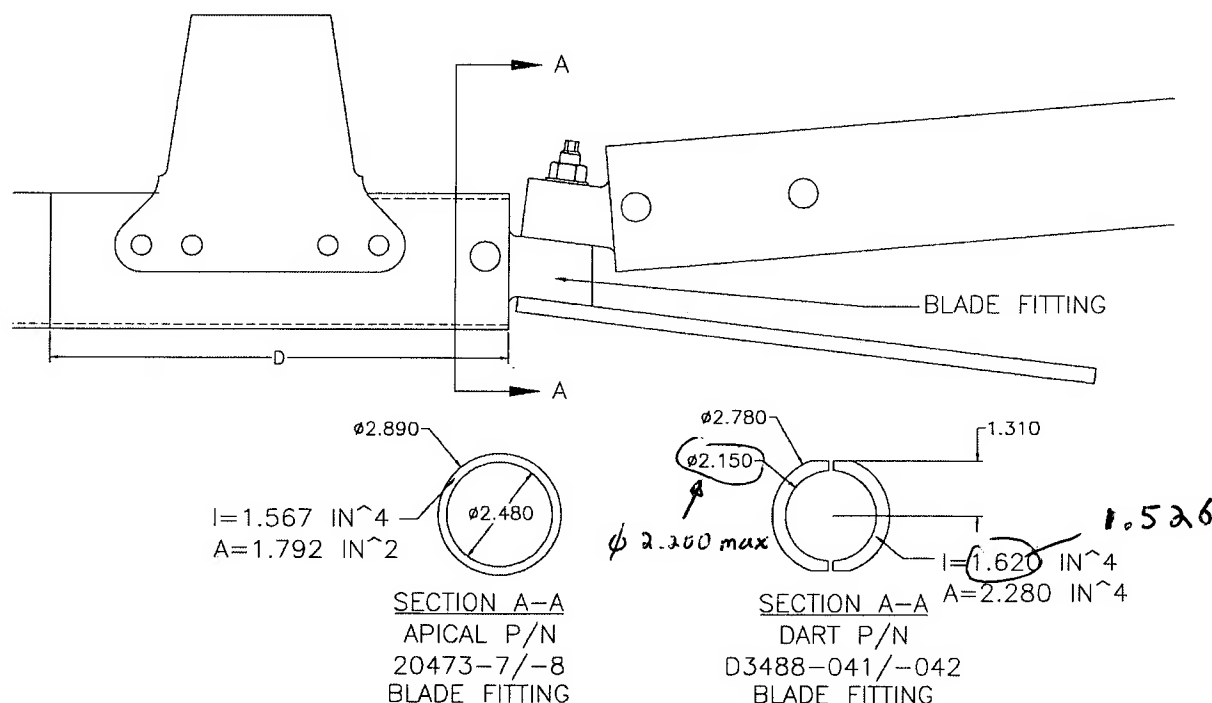
Cause: Chatter marks from machining during BORE
operation

For installation of the Apical Tri-bag and Apical Cylindrical Float bag systems onto OEM skidtube; it is required that the OEM P/N 350A41-1077-24/-25 blade fitting be substituted with the Apical P/N 20473-7/-8 blade fitting. In the proposed Dart skidtube configuration, the Dart D3488-041/-042 blade fitting will replace the Apical P/N 20473-7/-8 blade fitting.

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The following table compares the Dart D3488-041/-042 blade fitting to the Apical 20473-7/-8 blade fitting.

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Material	7075-T7351 per QQ-A-225/9	7075-T7351 per QQ-A-225/9
(I) Moment of Inertia of portion inside skidtube	1,526 1.620 in ⁴ (from D3488-041/-042 dwg)	1.567 in ⁴ (from D20473-7/-8 dwg)
(C) Distance to outer fibers	1.310 1.310 in (from D3488-041/-042 dwg)	1.445 in (from 20473-7/-8 dwg)
(A) Area at section A-A	2.116 2.280 in ²	1.792 in ²
Z=I/C at section A-A	1.165 1.234 in ³	1.084 in ³
D	10.69 10.69 in	10.53 in



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Revision: **B**

Date: 06.02.23

Because the material used to manufacture both blade fittings is identical, the fact that the I/C, A, and D for the Dart blade fitting is greater than the I/C, A, and D for the Apical blade fitting demonstrates that the Dart blade fitting can withstand higher bending moments and shear loads than the Apical blade fitting and less localized load is transferred into the surrounding skidtube at the fwd end of the blade fitting.

Finally, the Dart skidtube installation does not change any of the Apical hardware required to install the floats onto the skidtube or attach the aft extension onto the blade fitting. Therefore, this hardware is acceptable by identity.

4.0 Conclusion

Based on the qualitative analysis presented in this report, it has been demonstrated that the Dart D350-636-011/-012/-013/-014 skidtubes will be as good or better than the OEM 350A41-1016-1061/-1063/-1070/-1161/-1163/-1171 skidtube in terms of withstanding the loads from the Apical Cylindrical and Tri-bag float system. Additionally, this report demonstrates that the Dart skidtube can withstand localized bearing load with substantial margins of safety.